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INDEX TO CONTENTS

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AVIATION

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Vol. XII JANUARY 30, 1922 No. 5

The Record of the Air Mail Service

DURING the three and a half years of its existence the U. S. Mail Service has had its ups and downs. It started off remarkably well in the spring of 1918, and its performance continually improved until with a huge expansion of its activities which was not duly seconded by Congress its operation became unreliable and extravagant. This inefficiency cannot of course be entirely blamed upon the men who directed the Air Mail during this period. The reluctance of Congress to grant appropriations sufficiently large to operate the designated air mail routes with up to date equipment, in sufficient quantity, instead of with converted war airplanes, has to take a large share of the blame.

This situation has since been remedied, for while the Air Mail Service recorded during the fiscal year 1920-21 seventeen fatal accidents, during the subsequent five months which coincide with the change in administration there has been but one fatality, and that happened in the course of a ferry trip. The safety of the Air Mail has during the past half year considerably improved and so has its reliability, as may be seen from the figures printed in our last issue. Therefore, on the grounds of safety and reliability the Air Mail Service now compares favorably with the European airways.

The same can, unfortunately, not be said about the efficiency of the Air Mail, for while it gets the best out of the machines it operates, these airplanes are stupenduously inefficient. This is well illustrated by the fact that the standard mail airplane, the DH converted by the service, has a maximum mail capacity of 600 lb., and for all practical purposes this type cannot carry more than 500 lb. if the mails are bulky. As the engine fitted to this type is a 400 hp. Liberty, it follows that our mail airplanes carry at the most 1.5 lb. of pay load per horsepower as against from 4 to 6 lb. for modern commercial airplanes, specially designed for the purpose. Thus, the Air Mail still costs, per pound of pay load carried, four times what it should were it equipped with properly designed airplanes.

We have gone on record time and time again that in our opinion—which is shared by most students of commercial aviation—that converted war aircraft cannot be efficiently operated on a civil air transport service. There may be exceptions to this rule, in fact some converted war seaplanes make most excellent passenger carriers, but in the long run it will be found that the above stated view is fundamentally correct.

Unfortunately, the few trials which the Air Mail Service made with new constructions have not been very well considered, but experience is accumulating and we at least know now a good many sundry things about "how not to do it." Still, after three years of operation there is still wanting a satisfactory mail carrying fuselage for the DH, and the only solution seems to be to design a brand new machine from the ground up.

Looking at the question of the Air Mail from another angle, we believe that a government operated air line will always be fairly expensive. The history of railroad operation in wartime, and the present plight of the merchant marine, furnish some striking points to this argument. The ultimate solution of the Air Mail problem will undoubtedly come when privately owned and operated air lines will carry the mail under contract with the Post Office Department. The Bill introduced in the House by Representative Steenerson—which is reprinted in this issue—is a right step in this direction if it is merely meant to supplement the existing Air Mail Service by encouraging the formation of civil air transport companies which would carry mails under contract. But until such enterprises enter the field on a firm foundation, we believe that it would be a calamity of the first order to "wash out" the Air Mail Service now, when it is just beginning to improve its record.

There is one feature in the Steenerson bill which especially appeals to us, and that is its provision for charging special air mail postage. We have always believed it a mistake to carry mails by aircraft without making the public pay for the benefit accruing from faster transportation, just as it pays for special delivery. Not the least drawback of the present system is that the public is not taught to appreciate to which factor it owes quicker mail delivery. A special air mail stamp higher in rate than first class postage, would be a most effective means for teaching the public the advantages of the air mail.

Instruments and Flying

THE old idea that the only real fliers were those who did not use instruments has by now practically lost all its force. The commander of a training field in France once used a very efficacious way of demonstrating their value to an experienced pilot who did not believe in the use of instruments. This officer would disconnect the air speed indicator on one of his planes, and request a doubter to climb the ship to 5000 meters, and return to the ground in the shortest time. After this had been accomplished, the air speed indicator was again connected and a student was requested to repeat the performance. The student invariably won, although he was a much inferior pilot.

The reason for the above is simple. The doubter had only his judgment to guide him, whereas the student, knowing the speed at which the machine climbed best and glided best, held the needle of the air speed indicator at that point.

Commercial aircraft will frequently be forced to fly in unfavorable weather often when the visibility is practically nil. Unless instruments are used intelligently by the pilots, reliable flights under such conditions will be an impossibility, and the sooner this is realized by operating companies, the sooner will the public have faith in air transportation.

The Washington Conference and Aircraft

Report of the Sub-Committee on the Limitation of Aircraft as to Numbers, Character and Use

The Washington Conference on the Limitation of Armaments decided that it was impracticable to effect at the present time a limitation of aircraft. The reasons for this decision are clearly set forth in the remarkable report drafted by the Sub-Committee on Aircraft of the Conference which follows.—EDITOR.

In considering the limitation of aircraft as to numbers, character and use, the Committee on aircraft adopted a form of procedure which took up the various questions involved in the following order: 1 Commercial aircraft, 2 Civil aircraft, 3 Military aircraft. Heavier-than-air and lighter-than-air were considered separately since the conditions governing the two are not in all cases the same. An effort was made to determine whether or not it is possible to impose limitations upon their number, character, and use, and after discussion of the methods that might be employed to effect such limitation, whether limitation was practicable or not. This Committee feels that the desirability of placing any limitations whatever upon aircraft is a matter of policy, one which it is for the Main Committee itself to determine.

Commercial Aircraft

Before discussing any other phase of the matter it will be well to consider carefully the effects which would follow the imposition of the limitation upon the numbers and character of commercial aircraft which may be owned and operated by the nationals of a state. In the first place, if commercial aeronautics is allowed to follow the natural laws which have governed the development of all other means of transportation and communication, the number and character of such aircraft will probably depend on financial considerations. That is, commercial aeronautics as a business will not thrive unless the operation of the aircraft will return a substantial profit. The state may interfere with the operation of these natural laws by granting to the owners and operators of such aircraft a direct or indirect subsidy. By so doing, enterprises which would not otherwise be financially successful may be enabled to live and in this way the number of aircraft used for commercial purposes will be greater than if the natural laws of development had been allowed to take their course.

It is not easy to forsee what consequences to human progress will come in the future from the development of aeronautics in all its branches. They will certainly be marvelous where natural conditions are favorable to such development. To try to limit them now with arbitrary laws, even if these laws have the purpose of preventing war, would be in the opinion of this committee disastrous from the point of view of world progress.

If, among commercial aircraft, we class those owned and operated for sport or pleasure or convenience, the numbers of these will depend largely upon the wealth of the nation, upon the inclination of the people toward aeronautics and upon the cost of the aircraft thus employed.

The development of aircraft has presented the world with a new and improved means of transportation and communication. One of the causes of warfare in the past has been a lack of the proper distribution of the world's resources in raw material, food products, and the like. Another potent cause of war has been the lack of understanding between races, peoples and nations. Any addition to the transportation and communication facilities of the world should operate to improve the distribution of resources and likewise to lessen the causes of misunderstandings between peoples, and thus lessen the causes of warfare. Any limitation, therefore, placed upon commercial aeronautics would have the effect of limiting a means of transportation and communication between the different parts of the same state and between different states. It seems inconceivable that any limitation should be imposed upon commercial aeronautics unless it were with the avowed object of thereby limiting the air power of a state and thus decreasing the liability of war. Commercial aeronautics with its attendant development of an aeronautical industry and a personnel skilled in the manufacture, operation, and the maintenance of aircraft does furnish a basis of air power. The development of commercial aeronautics and the development of a nation's air power are inseparable.

All Aircraft Have Some Military Value

Speaking broadly, all aircraft will be of some military value no matter what restrictions may be placed upon their character. Some can probably be converted with but few changes into military aircraft, others can be designed so that with major or minor alterations, or even with none at all, they can be employed for military purposes. As a matter of fact, the uses of aircraft in war are many. During the World War highly specialized types were designed for special uses. Military aircraft have likewise been developed to a degree of perfection not yet reached in commercial aircraft. It is quite reasonable to suppose that similar development will take place in commercial aircraft, that they too will be especially designed for the uses to be made of *them*, and that they may depart quite radically from the military types used in the World War.

In military aircraft as a rule a premium is placed on performance. Consideration of initial cost, of cost of operation and of maintenance are largely disregarded. The safety and convenience of the operators and passengers are considered only as these effect their ability to perform their military duties. If, as seems evident, commercial aircraft must be specially designed for the service they are to perform in order to have a chance of being financially successful, any effort to provide for their conversion into military craft will introduce complications which will increase the cost of production and operation. This may itself automatically act as a limitation, for business enterprises will not be willing to have such conditions imposed unless they are compensated in some way for the extra cost.

War Value of Airplanes

The war value of an airplane may be said to lie in a combination of two or more of the following characteristics:

- a its suitability for offensive and defensive equipment.
- b its radius of action.
- c its speed.
- d its carrying capacity.
- e the height it can attain.

It is not desired to go too deeply into technical matters in this report. The Committee wishes, however, to point out that the peace value of aircraft is at present intimately bound up with the general characteristics which make up the value of the airplane in war. The last four of the characteristics enumerated above are dependent upon the relation between the amount of fuel carried, the horsepower of the engine, the lifting surface and the total weight. The Committee is of the opinion that formulae could be evolved defining the inter-relationship of these factors in such a way as to limit the war value of the machine built in conformity therewith. It is more difficult to ensure that war equipment shall not be mounted in a commercial airplane. In this matter the committee is of the opinion that definite rules cannot be laid down.

Radius of action is of high commercial value. A reliable air service from Europe to America in, say, 24 hr., should prove a highly profitable undertaking. Again, in countries where there is perhaps the greatest scope for the development of airways, countries of great deserts for example, radius of action is essential. Speed is plainly the characteristic on which aircraft rely to gain advantage in their competition with other means of transportation. It is not yet comfort and

security but time saving that will tempt passengers, mails, and valuable cargoes from old established services. To limit speed is to stop progress, to throttle aviation in its infancy.

The power of carrying numbers of passengers or quantities of goods is of obvious commercial value and even the attainment of considerable heights may eventually be a definite requirement. As a matter of fact the success of recent experiments indicate that with special means of super-charging engines, navigation of the air will in the future utilize high regions of the atmosphere to take advantage of a less resistance of the air and of favorable high velocity winds.

The factors which comprise military performance have therefore a high commercial value, and it is the opinion of this Committee that any limitation of the character of civil and commercial aircraft must hinder the natural development of aviation, it is probable that restriction as to character will have in fact an even more adverse reaction on the progress of aviation than would be caused by a restriction on numbers.

Method of Limitation

Aircraft can be limited as to number and character by an agreement arbitrarily fixing a maximum number for each nation that will not be exceeded and by imposing technical restrictions in such a way as to limit performance.

The difference in organic law as between nations will probably prevent a single system of limitations being of universal application. Moreover, the rules or formulae whereby alone the character of civil and commercial aircraft can be limited must be detailed and stringent. At the same time, they will be easy to evade, and infringement will not be obvious to the casual glance. Measurements of horsepower, supporting surface, fuel capacity, and weight will be necessary if security against evasion is to be ensured by any other means than by trusting to the good faith of the contracting parties. No state could consent to having the nationals of another power continually inspecting all of its manufacturing plants in order to ascertain whether the limitations it imposed were being enforced.

All these points received the closest of consideration with reference to the limitation of Germany's airpower and the matter is so complicated that the final drafting of the technical rules has not yet been completed. But taking rules as drafted and even assuming continuous inspection of a most stringent character, it appears that there are still loopholes for evasion. No rules can prevent aircraft being designed in *peace* to permit of the ready installment of larger tanks in war, engines can be made interchangeable enabling one of higher power to be rapidly installed; even carrying surface can be increased by the standardization and interchangeability of wings and other methods and it is not impossible to conceive of civil and commercial aircraft being designed with a view to ultimate war requirements.

For the above reason, the Committee is agreed that in the present stage of development of aviation a universal limitation by formulae of the character of commercial aircraft is impracticable.

Subsidies of Civil Aircraft

Without expressing an opinion as to the desirability of abolishing subsidies for the encouragement of commercial aviation, the Committee points out that such subsidies, direct or indirect, can have a great influence on the character and number of commercial aircraft in relation to their war value. In fact, subsidies will tend to decrease the natural divergence between military and commercial aircraft and render the latter more readily adaptable to war uses. It is necessary, however, to add that indirect subsidies or other encouragement are most difficult to prevent, and even when acting in good faith governments of different nations will place different interpretations on such encouragement.

The question of whether subsidies are granted or not will have great bearing upon development of commercial aircraft in general, and will effect the future welfare of the nations. This question, therefore, can not be determined from the point of view solely of the adaptability for war uses.

In this discussion a distinction is drawn between commercial aircraft and civil aircraft, the latter will comprise all aircraft operated by a state except those which it operates in connection with its military enterprises. Civil aircraft will, therefore, include any which are state-operated in the customs service, for transporting the mails, the exercise of its police powers and the like. It is readily apparent that as aircraft operate in a medium where there are no physical barriers, they can compete in some measure with every means of transportation used on land or water. It is therefore possible for much of the transportation requirements of any state to be met by the operation of aircraft. Such aircraft manifestly are not dependant for their being upon their ability to be operated at a profit. The state will decide how best it may enforce its laws, exercise its police power, transport state-owned merchandise or mails, and the means used will be those which are most efficient and most economical from the standpoint of the state itself. The cheapest will not always be the best or the most satisfactory.

The number and the legitimate use of aircraft by any government for such civil purposes will, therefore, be limited only by the estimate placed upon the service which they can render and by the consent of the people to raising by taxation the amount of money which must be employed for their acquirement, operation and maintenance.

If the civil agencies of a state use aircraft for police or other purposes that are essentially military in character this class of civil aircraft should be discussed under the limitation of military aircraft. The number and character of such civil aircraft can be limited only by an arbitrary agreement among the states. It would, again, be utterly impracticable to set up any agency acting under authority other than that of a nation itself to regulate the number of civil aircraft owned and operated by the state.

Lighter-than-Air Craft

The characteristics of lighter-than-air craft are such that limitation of number and character presents little technical or practical difficulty. It is a peculiarity of these craft that their efficiency is very intimately bound up in their size. Small airships have a war value of their own, but it is limited and they cannot be considered as offensive weapons. For example, a small vessel of this kind cannot attain any considerable height while carrying a useful load, and even if filled with non-inflammable gas its vulnerability to gun fire at the heights it could reach preclude its being utilized for such purposes as aerial bombardment. Only in large sized airships can a useful load be carried to a reasonable military height at a fair speed. Limitation of size is therefore sufficient to ensure that lighter-than-air craft should be incapable of offensive aerial action. Moreover the construction of large airships requires large shed accommodation and cannot be kept secret; in this respect they resemble surface warships. It is therefore possible to regulate their numbers and size, by a simple system of international agreement and infringement of such agreement can be readily detected without a detailed system of control.

The Committee is agreed that the possibilities of war use for large airships may still exist. Although in the the later stages of the World War it appeared as if the defense had the mastery over attack in lighter-than-air craft, the introduction of larger craft filled with non-inflammable gas and carrying their own protective airplanes may again permit bombardments being carried out by airships. This Committee desires, however, to draw attention to the fact that airships become increasingly efficient with increase of size. Any limit which is imposed on the size of commercial airships must shut the door on the possibility of their development for legitimate civil enterprises.

Civil Aircraft for War Use

The Committee is of the opinion that it would be useless to attempt to lay down a rule that civil and commercial aircraft should not be used in war, as they consider that no nation could deny itself the value for war purposes of their commercial machines provided that they are suitable for any warlike purposes. It is understood that when so used they will be manned by service personnel of the State and carry the proper distinguishing marks, and will in fact become war aircraft, their use does not therefore require discussion in this part of the Committee report.

The use of civil and commercial aircraft in peace is governed by the International Air Convention which amply safeguards a State's sovereignty in the air against abuse. This Convention has already been ratified by Great Britain, France, Japan, Belgium, Greece, Portugal, Serb-Croat and Slovene State and Siam. It will at a very near date come into force for these various Powers and later for the other signatory States and also non signatory Powers who desire to adhere to it.

Summary

This Committee understands that the purpose of this Conference is to promote peace and to remove the causes of warfare It must be understood distinctly that if the Conference decided to limit the development of commercial aircraft in order to retard the development of air power, the immediate result will be the retarded development of means of transportation and communication which will itself, if unrestricted, largely act to bring about the same result, the removal of some of the causes of warfare.

This Committee is unanimously of the opinion that in the present state of development of aeronautics there is a technical possibility of the limitation of numbers, character and use of civil and commercial aircraft with regard to their utilization in war, they are, however agreed that such limitation of numbers and especially of character is not practicable, except in the case of lighter-than-air craft of above a certain displacement.

As regards the desirability of limitations the Committee has touched on those factors which must be understood before arriving at a decision It feels it to be a duty to lay great stress upon the following fact which will have a decided bearing upon any determination of the proper policy to be adopted Any limitation as to number and character of civil and commercial aircraft, heavier-than air or lighter-than air, which is efficacious to hinder their utility for war purposes, must interfere disastrously with the natural development of aeronautics for legitimate civil and commercial enterprises To limit the science of aeronautics in its present state is to shut the door on progress It is for the Conference to decide whether the limitations which can with difficulty be devised and imposed are to be adopted at such a cost

Military Aircraft *

The Committee agreed that before entering upon a discussion of possible limitation of the numbers of military aircraft, it was desirable that the present relative air strength of the nations represented should be ascertained and tabulated in a simple form designed to facilitate comparison between them The results of this investigation are tabulated in appendices 1-2-3-4-5 attached to this report † It is remarked that though these forms afford a guide to the relative military air strength at the present day, it is impracticable to present a complete estimate of a nation's air power, since air power is (as has been already shown) intimately bound up in factors other than the military establishment Differences in organization and administration of the various national aerial forces are a further obstacle to direct comparison in detail, these factors must not be forgotten when studying the statement presented and must be kept in the foreground of all discussions as to the possibility of limitation.

The limitation of the number of military aircraft presents from one point of view less difficulty than the similar problem in the case of commercial aircraft It is obvious that if a limitation on the number of military aircraft is agreed upon between nations, it can be imposed by a state without that interference with the liberty of citizens which complicates the question of aircraft devoted to commercial pursuits. But when the details of such an agreement are considered, it will be found a matter of great difficulty to find a reasonable basis on which the allotment of relative strength can be made For example·

a. The *status quo* cannot serve as a starting point, since the state of development of air services differs widely in the case of the various powers, and in no case can these services be considered as complete.

b. The size of a nation's Navy and Army will influence the basis, in so far as aircraft are essential auxiliaries to these services.

c National policy will differ as between nations, some nations, for example, will wish to have large air forces for coast defence where others prefer to trust to other methods. Development on the lines of the substitution of air forces for other forms of force are likely to be considerable.

d The potentialities of air forces in policing and garrisoning semi civilized or uncivilized countries are as yet only partially realized The number of aircraft required for such duties will vary with the size and nature of the territories to be patrolled and with the value placed on their services by different nations.

e The geographical position and peculiarities of a state, the situation and strength of its possible enemies, and the nature of a possible attack must influence the number of aircraft it will desire to maintain

f Different terms of service for personnel will influence the effectiveness of air services and the size of the reserve.

g. The state of development or possibilities for civil aeronautics will have, as has been shown above, a direct bearing on the number of military aircraft which it may be desirable for a state to maintain

The problem of finding a suitable ratio between the air forces of various powers is thus at the present time almost insuperable

But even should it be possible to fix the ratio, such a limitation would be of little value without some limit as to the character of the aircraft When the question of limitation of naval armaments was considered by the Conference it was found necessary to limit the displacement of individual ships as well as the total tonnage In the absence of similar provisions the limitation of numbers of aircraft would only result in competitive building of aircraft of greater and greater power and size The methods of limitation must, therefore, attempt to legislate for both number and character

Heavier-than-Air

The following methods may be employed

1. The limitation of the number of military aircraft
2 The limitation of the amount of horsepower for military aircraft
3. The limitation of the lift tonnage for military aircraft.
4 The limitation of personnel for military aircraft.
5 The limitation of military aircraft budgets

These five methods may be applied in combination or singly and are considered in detail below

Limitation of the number of aircraft is the most obvious method of limiting the strength of the aviation forces, but in attempting to apply this method the question of size and type at once arises In order to make an effective limitation of the numbers of military aircraft to be maintained in peace time by any nation, it will be necessary to have a detailed understanding on the following points

1 On the number and types actually in use by organized aerial units

2 Total horsepower in assembled engines

3 On the number and type of engines held in reserve

4. On the replacement of planes crashed, worn out, or replaced by later models In the case of obsolete and other planes that are replaced by other models it would be necessary to enter into an agreement regarding the disposal of planes so replaced Otherwise it would be possible to build up an unlimited war reserve merely by classifying the planes so held as obsolete, or by converting them into civil or commercial planes.

5 On the limitation of the adoption of new and more powerful types.

The second method of limitation, limitation of horsepower, may apply to

1 Total horsepower in assembled planes.
3. Total horsepower in assembled engines
3 Horsepower in a single individual plane of a given type

The third method of limitation, limitation of lift tonnage, may apply to:

* In the part of the report which follows the word "military" is used in its widest sense to denote "pertaining to the fighting services whether naval military or air

† These appendices will be published in the next issue of AVIATION — EDITOR.

1. Total lift tonnage in assembled planes.
2. Total lift tonnage in all planes assembled or not assembled
3 Lift tonnage of a single individual plane of a given type.

Any method must presumably be based on wing area and horsepower. It has been mentioned that the actual horsepower may be unknown and it is likewise conceivable that a nation may discover a wing shape of extreme lifting efficiency and neglect to disclose the fact. Limitation of lift tonnage may therefore be wholly illusory.

The fourth method of limitation, whether of the total of organized personnel for war aircraft, or only of pilots in the permanent military establishments, fails by reason of the difference in organization between different states. A nation which has a separate air service has to include in its organized personnel, those employed in recruiting, supply, transport, administrative headquarters, etc., etc. In the case of nations whose air forces are contained in their naval and military forces, supply, etc personnel are included in naval and military establishments, a fair comparison cannot therefore be made Moreover the difference in terms of service, long or short, voluntary service or conscription, must introduce incalculable factors which directly affects the efficiency of organized air forces and the size and efficiency of the reserve.

The fifth method of limitation, limitation by means of limiting the budget and thereby controlling the amount of money that may be spent annually for aviation seems simple in theory but it is difficult of application The various methods of distributing budgets for material under different sub heads make it impracticable to determine or compare the actual sums expended exclusively for aircraft and the question is at present further complicated by the factor of the relative purchasing power of the currency of various nations

Impossibility of Limitations

Of the five methods of limitation, limitation by lift tonnage or horsepower appears to present the least objections, but to make these or any other methods effective, it would be necessary as previously pointed out to organize a system of international inspections Any system of international inspection would be almost certain to arouse ill-feeling and would tend to cause friction rather than to insure harmony and good feeling between friendly powers

Objections in detail to each suggested method of limitation have been advanced above—there is one insuperable objection which is common to every method, namely the close relationship which at present exists between civil or commercial aeronautics and air power Unless civil and commercial aeronautics are strictly limited—and it has been shown in the early part of this report that it is not practicable to limit them—a nation desiring air power in excess of the limit imposed or agreed to will develop its civil and commercial aeronautics to any extent desired

Granted a flourishing aeronautical industry, the number of the present type of perishable military airplanes active on any given date is only one of the elements of air power During the war a single American firm contracted to deliver 100 aircraft a day, and the output of engines can be organized on a similar scale. A nation's air power can thus be multiplied not only by the actual number of civil and commercial aircraft in use but also by the capacity of the industry to turn to the manufacture of military aircraft in large quantities. Limitation of the number of horsepower and lift tonnage would under such conditions prove illusory. This commercial industry will further provide a great potential reserve of pilots and skilled technical personnel and will thus discount to a great extent any limitation of numbers of the personnel of military aviation.

Lighter-than-Air Craft

Many of the remarks already made apply to lighter-than-air craft but, as in the case of commercial aircraft of this nature, limitation is both possible and practicable It is unnecessary to recapitulate the argument that the military value of an airship is dependent on its size, and the size of airships and the number maintained can be limited by agreement of a few simple rules Infraction of such rules can be rapidly ascertained without detailed inspection But such a limitation of lighter-than-air aviation forces would not effect a limitation of this kind of air power of a nation unless a limitation were also imposed on its lighter-than-air commercial activities. The line of demarcation between the large commercial airship and the military airship is very slight, and a commercial airship would require little, if any, alteration in order to adapt it to military purposes. The objections to the limitation of the number or character of commercial lighter-than-air craft have already been remarked on.

It is necessary in the interests of humanity and to lessen the chances of international friction that the rules which should govern the use of aircraft in war should be codified and be made the subject of international agreement. The matter has been considered by this Committee in connection with a draft code of "Rules for aircraft in war" submitted for remarks by the Committee on the laws of war The subject appears to the Committee to be one of extreme importance and one which raises far reaching problems, legal, political, commercial and military, it requires therefore exhaustive discussion by a single committee in which experts on all these issues are assembled.

This Committee recommends therefore that the question of the rules for aircraft in war be not considered at a Conference in which all the members are not prepared to discuss so large a subject, but that the matter be postponed to a further conference which it is recommended be assembled for the purpose at a date and place to be agreed through diplomatic channels

General Summary of Conclusions

The Committee are agreed that among the more important elements which influence the power that a nation may exert by means of aircraft are the following

1 The adaptability of its people to aeronautics

2 Geographic location and characteristics of the territory occupied by the nation and its dependencies.

3 The ability to produce and maintain aircraft and accessories.

4 The amount and character of aeronautical activity outside the military establishment, such as commercial and civil aeronautical activities, and sport and pleasure flying

5 The size and efficiency of its air establishment for military purposes consisting of (a) the active establishment including permanent headquarters, bureaus, squadrons, schools, technical establishments, depots of material and personnel, etc., (b) the reserve establishment including organized and unorganized reserve personnel and war reserve of material

1 The adaptability of a nation to aeronautics Interest of the general public in aeronautics seems to be inherent in some nations, in others it is dormant or almost lacking The confidence of a people in aeronautics in general is undoubtedly a factor worthy of serious consideration when estimating the air power of that country It is possible that a far seeing government may stimulate the interest of its general public in aeronautics by exhibitions, general educational measures, and by the encouragement in a financial way of individuals already interested, and thus increase the adaptability of its people to aeronautics

2 Geographic location and characteristics of the territory occupied by the nation and its dependencies This may be looked on as closely akin to 1

3 The Ability to produce and maintain aircraft and accessories The maximum aeronautical industry possible for a nation to build up under ideal conditions is determined by *a* the extent to which manufacturing in general is carried on; *b* by the character of articles manufactured, *c* by the manufacturing methods in general, that is whether articles are manufactured by machinery or by hand, *d* the supply and availability of essential raw materials. In the manufacture of many articles the raw materials used and the manufacturing methods are similar to those employed in the manufacture of aircraft and accessories. The amount of this class of manufacturing carried on in any country is an essential factor in estimating the ability of a nation to produce aircraft

The ability to expand an existing aeronautical industry rapidly enough to meet war conditions is one of the most important elements of air power This may be estimated by *a* the number of individuals skilled in the manufacture of aircraft and accessories, *b* the number of individuals whose

training in industries similar to the aeronautical industry forms a basis for learning readily and rapidly the special problems encountered in the manufacture of aircraft and accessories, c the size and condition of the existing aeronautical industries and the size and number of manufacturing concerns that can readily be converted to the manufacture of aircraft and accessories, d the existence of a definite program previously determined upon and the extent to which orders have been previously placed in anticipation of an emergency with a consequent perfection of plans, e the amount and state of availability of the essential raw materials, f the quantity of available jigs, tools, dies and production drawings for going into quantity production of standard equipment.

4. The amount and character of aeronautical activity outside the military establishment has been exhaustively discussed under the Limitation of Civil and Commercial Aircraft.

5. Existing establishment of aircraft used for military purposes and the reserve The size of the organized reserve will depend upon the size of the military establishment and the rate at which members of the military establishment are trained and returned to civil pursuits. Any reduction in the permanent peace-time establishment will carry with it a consequent reduction in organized and trained reserves. There is, however, a type of personnel whose civil pursuits fit them for immediate service in the air establishment This class is made up by those engaged in commercial and civil aeronautics and industrial pursuits which require the same trades and basic knowledge and experience as is required in the operation and maintenance of military aircraft. This class will not be seriously affected by any change in the military establishment.

Technical considerations have led the Committee to the conclusion that the limitation of the fifth element, namely, the size and efficiency of peace-time air establishments for military purposes (including the active establishment and the organized reserve), although theoretically possible, is not practicable. The Committee also desires to lay stress on the fact that, even if such limitation was practicable, it would not prevent the use of air power in war, but would only operate to give greater comparative importance to the other elements of air power which cannot be limited for the reasons given in the report

Final Conclusions

The Committee is of the opinion that it is not practicable to impose any effective limitations upon the numbers or characteristics of aircraft, either commercial or military, excepting in the single case of lighter-than-air craft

The Committee is of the opinion that the use of aircraft in war should be governed by the rules of warfare as adapted to aircraft by a further Conference which should be held at a later date

Respectfully submitted by
COMMITTEE ON AIRCRAFT

For the United States of America William A Moffett, Chairman, Rear Admiral, U. S N. Mason M Patrick, Major General, U S A

For the British Empire J F A Higgins, Air Vice Marshal, R A F

For France: Albert Roper, Capitaine, Pilote Aviateur, French Army

For Italy: Riccardo Moizo, Colonel, R I. A.

For Japan: Osami Nagano, Captain, I. J N

NOTE The Italian Representative believes and desires to place on record, that one way in which it would be possible to limit the air power of a nation would be by placing a limit upon the number of pilots in the permanent military establishment and consequently agrees with the general reasoning of the report in so far as it is not contrary to this opinion.

(Signed) RICCARDO MOIZO
Colonel, R I A

Helium and Airship Piloting

The following letter has been received

Editor, AVIATION

I was surprised to read in an editorial entitled "Helium as an Aid to Airship Piloting" in Aviation Vol XII, No 1, Jan. 2, 1922, the following sentence.

"In the case of an airship—it will obviously make no differences in the riding qualities whether some given portion of the total weight be carried in the car or in the gas."

It seems more obvious that the distribution of the weight has a material bearing on the riding qualities of an airship Any redistribution of weight which increases the radii of gyration of the airship about its axes may be expected to be reflected in more stable riding qualities. If the radius of gyration about an axis is increased more energy will be necessary or for the same time of application a greater force will be required to give the airship any definite velocity of rotation.

The value of an increased inertia stability should be appreciated markedly in an airship, which because of its streamline form tends to augment a deflection of the longitudinal axis from the trajectory of the center of gravity

A deflecting cause of any given energy or any given force over a limited time may be expected in the case of a longer radius of gyration to result in a smaller rotation of the airship and will, therefore, involve a smaller augmentative action due to the streamline shape

ARTHUR HALSTEAD

Our correspondent is correct in his criticism of our incomplete statement, which was perhaps misleading It was not made sufficiently clear that we were speaking of the direct effect of weight alone, and had not intended going into the indirect effect of a change in its distribution. The latter is a rather complicated subject which our correspondent in his turn touches only very superficially

The usual criterion of inherent directional stability (or rather instability) is the radius of the flight path curve which is followed by the airship with controls locked On this the horizontal redistribution of weight has *absolutely no effect.* From a practical standpoint however it must be admitted that a pilot can use his controls with better judgment when the deflecting movements are slower.

The vertical stability is complicated by two additional factors (1) The existence of an upward or downward static force of slowly varying magnitude (2) The pendulum effect due to the center of gravity being below the center of disdistribution of weight has much more effect than a slight placement. In respect to both of these items the *vertical* change in the moment of inertia. In particular, a raising of the center of gravity (which with *most* types of ships would result from the use of helium) would effect the control as follows

1 There would be a *larger* "augmentative action due to the streamline shape," that is, the ship would find equilibrium at a larger angle of pitch, due to the decreased static stability

2. It would be easier to incline the ship intentionally (as for example to overcome a static force), but harder to get it back to normal again

3 The tendency to periodic pitching due to pendulum action would be decreased

As to whether these items would net an advantage or disadvantage depends on so many details of design that it is impossible to be dogmatic on the subject Certainly we cannot pretend to be supreme authorities on it, and we should welcome any further contributions from those who have had experience with helium or have given it thought.

We cannot help mentioning however that all this discussion about distributed weight is getting rather away from the original subject, as there are plenty of ways of distributing weight without using helium As a matter of fact, one of the frequently serious problems of design is how to *avoid* putting too much weight toward the ends of the ship —R. H U.

Existence of Air Mail Service Threatened

Director of Budget Recommended Air Mail Appropriation of $2,200.000 -- House Appropriations Committee Eliminated It

The U S Air Mail Service which started on May 15, 1918 with a daily scheduled route between New York and Washington and which since Sept. 8, 1920, has delivered mail along a continuous route between New York and San Francisco, is now threatened by the Appropriations Committee of the House on the ground that it is an expensive service and not of particular advantage

General Dawes Sustained Air Mail

This recommendation of the House Appropriations Committee is surprising in view of the fact that General Dawes, Director of the Budget, regarded the Air Mail as absolutely necessary and recommended $2,200,000 for the next fiscal year July, 1922-July, 1923 The Sub-Committee of the House Appropriations Committee reduced that figure to $1,935,000. On Jan 11, the House Appropriations Committee (Chairman Madden) entirely eliminated the Air Mail appropriation and reported the Post Office Bill to the House, on the floor of which the general Post Office Bill is now being debated. It the Committee's action is sustained by the House and Senate there will be no Air Mail service in the United States after July 1, next.

The Air Mail for the present fiscal year (1921-1922) had an original appropriation of $1,250,000 which was later increased by a deficiency appropriation to $1,425,000 This has maintained the New York San Francisco Service, the only service now operated, which last year has had a record of 89 per cent efficiency About 100,000,000 first class letters have been carried since the Air Mail was started, most of them across the continent. Service between the Atlantic and Pacific has been speeded up to between 48 and 60 hr., where 100 hr. at least are required by all train service

Over one hundred of the larger cities in the country have petitioned the Government to provide them with an Air Mail Service.

The Air Mail planes cost practically nothing, as most of those in use have been obtained from the surplus supply of the United States Army, which otherwise would eventually have been scrapped, without use, due to deterioration through old age.

Value of the Air Mail

"With the discontinuation of the Air Mail Service," says a circular issued by the Aero Club of America to its members, "civil, military and commercial aviation will suffer an almost irreparable loss, as the Air Mail Service operating all the year round from the Atlantic to the Pacific gives

(1) Research work embracing all phases of practical flying and a knowledge of the air conditions across the Continent during all seasons of the year (Military aviation being confined in winter to the fields in the South),

(2) It maintains a trans-continental air highway which will be used by civilian and commercial aircraft and can be used by military aircraft in case of emergency. The airdromes, hangars and shop facilities of this highway would be lost to aviation without the Air Mails;

(3) The Air Mail Service has and is developing the best group of practical aviators in this country, flying, as they are daily, cross country under everything but impossible flying conditions. Their experience and "flying sense" will be invaluable for the training of future pilots, and their practical experience of inestimable value to the engineers and constructors.

"Civil and commercial aviation will suffer a deplorable setback if the Air Mail is abandoned. Congress realized this a year ago, when the same committee cut the Air Mail appropriation It was partly restored.

"The National Advisory Committee for Aeronautics has urged the continuation and development of the Air Mail.

"Your duty is clear. Support the National Advisory Committee in supporting the Air Mail and by writing or telegraphing your representative in Congress. Prove now the power of the United Air Associations by supporting a branch of the Government Air Service when that branch calls upon you for support."

The Aeronautical Chamber of Commerce is similarly arousing its members to action and several meetings have been held during the week in which the situation and the steps required were discussed.

In connection with the question of the continued existence of the Air Mail Service which will shortly come up in Congress, considerable interest attaches to the bill (H.R. 9462) introduced Dec 10, 1921, in the House by Representative Steenerson. This bill "to encourage commercial aviation" would authorize the Postmaster General "to contract with any individual, firm, or corporation for the transportation of mail by aircraft between such points as he may deem advisable. The postage on matter to be carried by aircraft shall be three times the usual rate of postage, to be prepaid by distinctive postage stamps affixed, to be issued in such denominations as the Postmaster General may prescribe, and the compensation of the contractor shall not exceed two-thirds of the postage on the mail matter so carried"

German Airship Expert Arrives

Negotiations for the establishment of airship lines across this contient are believed to be the cause which has brought Walter Bleistein, Director and Chief Engineer of the Schutte-Lanz Airship Co of Germany to Washington. Dr. Bleistein, who is both an airship pilot and engineer, would neither confirm nor deny these reports, but agreed to the possibility of such lines in this country and evinced considerable enthusiasm over the future of the rigid airship as a commercial carrier He believes that airships for transportation would supplement the present methods of long distance routes without competing with them

Believing in both the safety and economy of airship, Dr. Bleistein stated that not a passenger had been hurt and no trouble experienced in several years of transportation in Germany With the most advanced designs and specifications for passenger and freight ships, Dr Bleistein hopes to interest American commercial operators, it is believed.

In this climate he believes almost perfect operation could be maintained and perishable freight rushed across the continent in the excellent time of 36 hr As a valuable means for shippers, he indicated that it seemed possible to keep up a schedule of 16 hr from New York to Chicago; 36 hr., New York to San Francisco; 55 hr, New York to Europe; and 24 hr San Francisco to Honolulu; while toward the southern continent he estimated that goods could be delivered at Santiago, Chili, or Buenos Airies in 90 hr.

Aviation Executives' Luncheon

A score of men representative of the aircraft industry gathered at an informal luncheon Friday, Jan. 20, at the Café Boulevard, New York. Invitations to attend, which were restricted to aviation executives, were issued by R. R. Blythe, manager of the aircraft department of Johnson & Higgins, insurance brokers. The luncheon answered the purpose of affording executives a medium for an informal exchange of views

The next luncheon will be held at the Café Boulevard Feb. 3 at 12 15 p. m, and thereafter the first and third Friday of each month.

New Method for Testing Aerofoils in Flight*

Consisting in Suspending an Aerofoil from an Airplane and Measuring the Resultant Force by Tension in Wires

By F. H. Norton

From the very beginning of the science of aeronautics there has been desired a satisfactory method for making tests on aerofoils and other aerodynamic bodies under the identical conditions of their use on the airplane. The wind tunnel and the whirling arm will give velocities equivalent to those of flight but the size of the wings that may be tested in this way is only a tenth or twentieth part of the full sized ones. Attempts have been made to test full-sized wings when mounted upon a car or automobile but due to the interference of the ground and to irregular winds the results have not been satisfactory and these methods have now been practically abandoned.

An attempt is made here to provide a method for testing full-sized, or nearly full-sized aerofoils at airplane speeds and under the same conditions of turbulence that are encountered by the airplane. The present investigation is of course only of the most preliminary character, so that the accuracy of the result is not high. The method however has been carefully studied, especially in regard to its inherent errors and the time required for making tests. Sufficient experience has been gained to justify the design of a new balance for use on a larger airplane.

Methods and Apparatus

The apparatus used for measuring the tension in the supporting wires is shown in Fig. 1. A heavy steel tube passes laterally through the fuselage and is connected by a pair of levers to a spring scale on the instrument board. On the center of the tube a windlass is attached for reeling up the wires passing to the wing. The two forward wires run outward from the windlass over pulleys at the end of the tube while the third wire runs backward and down through the fuselage. The angle of attack of the wing is changed by reeling in or out the rear wire while the others are held stationary.

The angle at which the wing trails back is measured by means of a reading telescope mounted on the side of the fuselage with a graduated circle. The vertical is indicated by means of a small pendulum. The pendulum although only slightly damped was very steady and would seem to be a very satisfactory method of indicating the vertical in uniform flight.

The angle of attack of the wing itself is measured by placing on the wing surface a liquid inclinometer which is viewed through the same telescope as used for measuring the angle. In this test the readings of the angle of attack were rather unsatisfactory due to the length of the bubble and to insufficient damping of the liquid, so the fluctuations were at all times considerable. Much better results can be obtained by measuring the angle of attack in the cockpit from the length of the wires.

The first aerofoil constructed was of solid white pine, and a few runs were made with it. As the weight of this aerofoil was considerable and as it was feared that it might do considerable damage to the airplane should it reach an angle of negative lift, it was considered safer to construct another one of lighter wood and fabric in the same manner as the usual type of airplane wing (Fig. 2). The forward wires are attached to the leading edge of the wing and the third wire is attached to the rear end of a wooden boom running backward for about 5 ft. On the forward end of this boom there is a small vertical fin and at the rear end a large aluminum rudder, both for the purpose of giving directional stability. The area of these surfaces is probably much larger than there is any need of and wind tunnel tests will be made in order to determine the minimum size that may be used. The size of the boom is also much larger than required and its resistance can be at least halved.

When taking off and landing, the wing is drawn up close against the under side of the fuselage, a hole being cut in the fabric to take the upper part of the fin. When the airplane has reached a sufficient altitude it is throttled down to about 45 m.p.h. and the windlass is slowly unwound; the angle of attack being gradually increased in order to correct for the change in direction of the air flow as the wing is lowered below the influence of the downwash. Incidentally, the angle and velocity of the air flow can be studied for any distance above or below a flying airplane by means of a trailing aerofoil. After the wing has reached the desired distance below as determined by a mark on one of the wires the airplane is held at exactly sixty m.p.h. and readings are taken on the balance and with the telescope for various angles of attack. No difficulty at all is experienced in making turns with the wing hanging down, although no banks greater than 20 deg. were attempted. Several runs were made with the wing in extremely bumpy air and although the wing swings around considerably, mainly in a lateral direction, there appeared to be no danger of its getting out of control, but in making accurate tests it is quite essential that the air be smooth. After

Fig. 1. View of balance assembly—Fig. 2. The stripped aerofoil—Fig. 3. The trailing wing in flight

* N.A.C.A. Technical Note No. 77

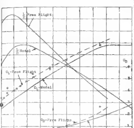

Fig. 4. Comparison of model and free flight tests of N.A.C.A. 64 aerofoil

a test has been completed the wing is reeled up against the fuselage. Care has to be taken when gliding down to the field not to reach too great an air speed for the force on the wings may become dangerously large. Over twenty flights were made with this wing, the piloting being done throughout by T. Carroll of the Committee's staff.

Throughout the conduction of the tests it is necessary for the observer to use the utmost care that the lift on the wing does not reach such a small value that it can not be balanced by the weight of the wing itself. When using larger aerofoils than this one there would be great danger in such an occurrence as the fuselage or tail surfaces would very probably be seriously crippled. This danger can be guarded against by having an electrical contact on the balance set so that when the pull in the wires decreases below a certain safe value the angle of attack will be automatically increased.

The lift and drag on the aerofoil are given by the following expressions where θ is the angle of trail from the vertical, W is the weight of the wing, D_1 is the effective resistance of the wires and supporting boom, and R the pull in the wires.

$$L = R \cos \theta - W$$
$$D = R \sin \theta - D_1$$

Precision

The factors which enter into the computation of the lift and drag of the wing are the air speed, the tension in the wires, and the angle of trail, and the resistance of the wires and boom. An experienced pilot can easily hold an airplane within one mile an hour of the given speed when the air is smooth, but if the air speed reading is recorded with each reading of the balance even a greater variation than this is of little importance. By calibration over a speed course it should be possible to measure the air speed of the plane to within ± 0.5 m.p.h. If we fly, for example, at 60 m.p.h. this will introduce an error into the force readings of ± 1.5 per cent.

The tension in the wires, as far as the balance itself goes, can be measured as closely as desired, the limit of accuracy being the steadiness of the load. In these experiments it was found that the spring balance vibrated quite rapidly over a range of from 5 to 10 per cent of the absolute reading although a mean reading could be taken to the nearest pound. It is thought that this vibration can be greatly reduced by using a suitable dash pot in the system. There is little doubt that the value of the resultant can be read to within one pound of its true value under all conditions.

The angle at which the wing trails back from the vertical may vary between 5 deg. to 20 deg., according to the L/D of the aerofoil. It might be thought that a wing supported on wires 30 or 40 ft. below the airplane would make severe oscillations but when the air is smooth the wing remains so steadily in one place that it is almost impossible with the eye alone to detect any relative motion with the airplane. When the telescope is used a slight oscillation can be observed but this is so small and so regular that there is no trouble in obtaining a mean reading of the angle to 0.2 deg. An error of 0.2 deg. in the trail angle will introduce an error in the drag of about 3 per cent when the L/D is at a high value.

Measuring the Angle of Attack

The method of measuring the angle of attack in this experiment was rather unsatisfactory as the fore and aft oscillations of the wing, although small, produced a considerable longitudinal acceleration on the wing which made the bubble in the inclinometer vibrate back and forth over several degrees; so that an estimation of the angle of attack was quite difficult. It is believed that much better results can be obtained by calibrating the windlass in such a way that the angle of attack can be directly read from the cockpit. This would have the advantage in that it would allow the observer to set the angle to definite values each time. The angle of attack however is not of primary importance and, even if it were found that it could not be determined with accuracy, it would not greatly reduce the value of the test.

Another source of error which may be serious if care is not taken is the vertical direction of the flight path. By the careful use of a sensitive statoscope, levels should be maintained good to within 20 ft. in a mile which represents about 0.2 deg. Larger errors than this however may be introduced due to the rising and falling currents which are often present in the atmosphere. It seems probable however that rising and falling currents occur only when the air is bumpy, and as tests can not be made in bumpy air, it does not seem as if the errors due to rising and falling current would be troublesome. It is always advisable to fly these tests either early in the morning or just before sunset, as the air at these times is almost sure to be smooth.

The true drag of the wing is the difference between the total drag of wing and supports, and the supports alone. It is evident that the greater the resistance of the supports compared with that of the wing, the more accurately must all measurements be made. It is probable that the resistance of the supports in free flight can be cut down to one-half the minimum drag of the wing. This is as small a proportion of support drag as is usually obtained in wind tunnel tests.

The drag of the wires and boom may be determined either by a wind tunnel test or by trailing them in flight. The latter method has been tried out and no difficulties were encountered. The interference between the boom and wing may be considerable and should be measured in the wind tunnel on a model.

Results on the N. A. C. A. 64 Aerofoil

A 12 in. by 72 in. aerofoil as described above was mounted on the airplane and a test was made with the wing about 20 ft. below the balance. The two forward supporting wires were each 0.002 in. in diameter while the rear wire was 0.15 in. in diameter. The drag of the wires and boom was measured by lowering the boom and wires alone and measuring the angle at which they trailed back at 60 m.p.h. In order to get the correct angle of trail the boom was constructed partly of lead. The oscillations of the boom were slightly greater than for the wing but a mean reading could be taken with considerable accuracy. The resistance of the boom and wires which varied of course with the angle of attack, amounted to two pounds at zero angle, which is approximately equal to the minimum drag of the wing itself. In this test no attempt was made to obtain the interference between the boom and the wing, therefore the drag as read is probably somewhat high, which probably accounts for the abnormally high L/D measured for this section. The total time required in taking the readings on the wing (Fig. 4) was not over 10 min., and the time in the air (two flights) not over 30 min.

The results of this section are plotted in Fig. 4 together with the test of a model of the same aerofoil in the wind tunnel. It will be noted that the lift curve although parallel to the model curve is considerably higher at all points. Except in a few cases, the observed points lie fairly close to their curve. The drag curves lie very close together although the free flight values are somewhat lower at low angles of attack. Both the lift and drag curves show that the angle of attack in free flight was probably somewhat in error and that both curves should be shifted about a degree to the right. The maximum L/D in free flight is rather high, reaching a value of 21 as compared to 16 for the model test. While the increase in scale would be expected to increase the L/D to a considerable degree the free flight curve is probably too high due to the fact that the interference between the boom and the wing was not taken into account. These results are only of the most preliminary nature and no pretense is made for accuracy, but it is believed that rough as they are they demonstrate clearly the feasibility of this method.

Tests of Spheres and Streamlined Bodies

In order to investigate the possibilities of measuring the drag of bodies in free flight, a bomb-shaped model and a sphere were each let down below the airplane on a single wire. The bomb oscillated considerably after changing speed or after turning, but if steady conditions were held it appeared as steady as the aerofoil. The sphere was equally steady and even though the test was made on a bumpy day, the trail angle of 18 deg. could be read to 0.5 deg. with ease. There seems to be no reason why the resistance of spheres up to 3 or 4 ft. in diameter can not be measured in this way with a high degree of accuracy. Unfortunately the time was not available for making any actual measurements with these bodies, but it is hoped that extensive work of this kind can be carried out in the near future.

Conclusion

The results from this investigation demonstrate that it is possible to make tests on large wings in free flight with a considerable amount of ease and accuracy. It is recommended that further work be carried out along this line on an airplane of greater capacity and on wings of larger size. In this connection a balance should be designed which will automatically record the air speed, the force on the wires, and the angle of trail for each angle of attack. It would also be advisable to record the force on the rear wire separately so that the moments of the wing could be determined. On the larger wings it will also be necessary to provide a power windlass for lowering and pulling up the wing and as suggested before an electrical safety device to prevent the wing from getting a negative loading. It is believed that if such a balance and apparatus is designed, wings of 30 ft. span and 5 ft. chord can be tested as quickly and accurately at a speed of 100 m.p.h. as a small model can now be tested in the wind tunnel.

Staff of Naval Bureau of Aeronautics

The officers at present on duty in the Bureau of Aeronautics, Navy Department, are as follows.

Chief of Bureau—Rear Admiral W A Moffett, U S N

Asst. Chief of Bureau—Capt. H C Mustin, U S N

Aide to Chief of Bureau—Comdr W J Giles, U S N

Administration Division—Comdr. V K Coman, U S N; Lt. Comdr R M Griffin, U S N, Lt. Comdr S H Quarles, U S N.

Plans Division—Comdr T G Ellyson, U S N, Lt. Comdr Z. Lansdowne, U S N, Lt. Comdr W Capehart, U S N, Lieut. F H Becker, U S N

Flight Division—Lt. Comdr E. W Spencer, U S N, Lt. R. G Pennoyer, U S N, Lt. A W Radford, U S N, Lt. G. Morgan, U S N, Lt. W. L. Richardson, USNRF, Lt. C. N. Keyser, USNRF, Lt. W F Reed, USNRF, Lt. F. W. Neilson, U. S. N.

Material Division—Comdr E S Land, (CC) USN; Comdr. J. C. Hunsaker, (CC) USN, Lt. Comdr. S. M. Kraus, USN, Lt. Comdr. O Fulton, (CC) USN, Lt. Comdr. B. G Leighton, USN, Lt. Comdr O. B Wilson, USN, Lt. W. S Haston, USN, Lt. K. McGinness, USN; Lt K. B Bragg (CEC) USN; Lt V R Dunlap (CEC), USN, Lt. W. S Diehl (CC), USN; Lt. C B Harper, (CC), USN, Lt. R. D MacCart (CC), USN, Lt C J McCarthy (CC) USN, Lt. E. W. Rounds (CC) USN, Lt C H Congdon (CC), USN, Lt. H. W Baughley, USN, Lt. E F Stone, USCG; Lt B. G. Bradley, USMC, Ensign C E Bauch, USN, Ensign F Miller, USN; Ensign W. Miller, USN.

Headquarters, U. S. Marine Corps Aviation—Lt. Col. T. C. Turner, USMC, Capt. R E Williams, USMC

The Commanding Officers and executives of air stations and fleet air detachments are as follows:—

Naval Air Station, Pensacola, Fla.—Capt. H H Christy, USN; Comdr. J H Towers, USN., Captain of the Yard

Naval Air Station, Hampton Roads, Va.—Capt. S H R Doyle, USN., C. O.; Lt. Comdr G C Dichman, USN, Executive.

Naval Air Station, Lakehurst, N J—Lt. Comdr J P Norfleet, USN., C. O; Lieut A. R. Houghton, USN, Executive.

Naval Air Station, Anacostia, D C—Lt Comdr. C. Y. Johnston, (Ordered), Lt H J Brow, USN., Executive

Naval Air Station, Coco Solo, C Z—Lieut. F. W. Byers, USN

Naval Air Station, San Diego, Calif.—Comdr F. R. McCrary, USN, C O

Naval Air Station, Pearl Harbor, T H—Lt. Comdr. R. D. Kirkpatrick, USN, C O, Ensign N M Kindell, USN., Executive

U S Atlantic Fleet Air Squadrons,—Capt A W. Johnson, USN., Comdr, Comdr A C Read, USN., Exec. Aide.

Air Boat Squadrons—Lt Comdr H. B Cecil, USN., C. O; Lt. W D Thomas, USN, Exec.

Torpedo Plane Squadrons—Lt Comdr H. T Bartlett, USN, C O; Lt E. L Ericson, USN., Executive.

U S Pacific Fleet Air Squadrons—Capt. H V. Butler, USN, Comdr.,Lt Comdr. P. N. L. Bellinger, USN., Exec. Aide.

Spotting Squadron No 4—Lt Comdr M. A. Mitscher, USN, C O

Combat Squadron No 4—Lt Comdr W Masek, USN., C O

Spotting Squadron No 3—Lt Comdr O D Murray, USN., C O

Combat Squadron No 3—Lieut F W. Wead, USN, C. O.

Patrol Squadron—Lieut O. L. Coupo, USN, C. O

The Marine Corps Aviation activities and the Commanding Officer of each are as follows.

Marine Flying Field, Quantico, Va—Maj Roy S. Geiger, C O

First Air Squadron, Santo Domingo City, D R—Maj Alfred A Cunningham, C O

Fourth Air Squadron, Port au Prince, Haiti—Maj Francis T. Evans, C O,

Flight "L", Sumay, Guam, M I—Capt. Ralph J Mitchell, C O

Marine Flying Field, Parris Island, S C—2nd Lieut. Willard R. Enk, C O

Marine Aviation Detachment, Naval Training Station, Great Lakes, Ill—Capt Benjamin Goodman, C O (This officer will be relieved on January 15, 1922, by Marine Gunner Frank F. Pattcamer)

Picking up Burdens from an Airplane

An Account of the First Experiments of Godfrey L. Cabot, and of their Development by the Huff, Daland Co.

By M. Fitzhugh Browne

The problem of picking up burdens from an airplane while in flight with the idea of making long non-stop flights possible, or of thereby accelerating the transportation of mail, has for a long time been considered an almost impossible, or at any rate a highly impracticable achievement.

Birth of the Idea

At the time when shipping was very scarce as a result of the German submarine campaign, in 1917, and the freight rates increased until they were about one hundred times what they had been before the war, the problem of sending aircraft across the Atlantic under their own power was seriously considered by our Naval Aviation. As a matter of fact, the development of the NC type of flying boat one of which eventually did cross the Atlantic under its own power was the direct outcome of this idea.

While the Navy Department was thus endeavoring to supplement the shipping deficiency, Godfrey L. Cabot, an early aviation enthusiast, who served as a lieutenant in Naval Aviation during the war, started experimenting on his own account with a "pick up" device in connection with a Burgess-Dunne seaplane he owned. The first experiments, made chiefly over Marblehead and Salem Harbors, having demonstrated the practicability of the scheme, Mr. Cabot entrusted the Huff, Daland Co. of Ogdensburg, N. Y., with the continuation of the experiments.

Mr. Cabot's plan was to fly multi-engined aircraft with nothing but the fuel and the bare machine, and to send the armament over by boat, as it could be stowed in small space and transported in that way more easily than by airplane. As way stations he proposed to use vessels furnished with directional wireless, and to employ a series of simple signals whereby each boat would be identified by numbers and each airplane by letters.

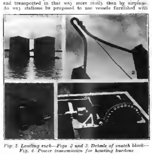

Fig. 1 Loading rack—Figs. 2 and 3 Details of snatch block—Fig. 4 Power transmission for hoisting burdens

The first difficulty in picking up burdens in flight is the matter of horizontal acceleration. At the speed of an airplane any ordinary rope is instantly snapped if hitched to even a very small burden, and it was supposed by many experienced aviators that the scheme was impossible for this reason.

The second difficulty was to devise a method of grappling that would seize the burden and nothing else. An ordinary grappling iron is apt to seize something you don't want, and though this was fully realized, he tried grappling irons in his early experiments simply to save time and to develop other features of the invention. The danger of being tripped by the rope and crashed was easily avoided by selecting a rope having less tensile strength than the thrust of the propeller.

Fig. 5 The Huff Daland HD biplane with which the latter "pick-up" experiments were made

The Early Experiments

The first attempt was with a can of water weighing less than 6 lb., hung on the bight of a rope which in its turn was hung on the tops of two poles, about 10 ft. from the water, on a triangular shaped float, anchored in Salem Harbor. An ordinary grappling iron was used and yanked off the rope but the pull was so great that the rope wrapped around the burden was broken. Later a long steel spring was added to furnish elasticity to the rope, and the next time an attempt was made a slight jar as if someone had tapped the bottom of the pontoon was felt. As a matter of fact, the pontoon had cleared the float by 4 ft., and the jar felt was the picking up of the burden in the minute fraction of a second. The rope that was broken in the first attempt by picking up a burden weighing 6 lb. had a breaking strain of between 150 and 200 lb.

Experiments thus far had shown that to the difficulty of horizontal acceleration must be added a new difficulty not foreseen, that is, the dragging of the burden through the water at a speed of 65 to 75 m. p. h. and that in the next experiment with a loading-rack on a moving sea-sled the limit of the burden would be determined not by horizontal acceleration, but by the drag in the water.

Mr. Cabot used for his experiments with a moving loading rack a sea-sled lent by Captain Mustin, U. S. N., with a speed of 37 m.p.h. This opened up new mathematical problems, for the velocity of the wind and the sea-sled cut down the speed of the airplane relative to the loading-rack, which resulted in less tension in the rope and increased the time possible for the rope to reach its maximum elongation. The difficulties of steering over the moving mark were much greater.

On October 3, 1918, in Broad Sound, Boston Harbor, near Shirley Gut, Mr. Cabot succeeded on the fourth attempt in flying straight over the sea-sled, picking up the burden, and then soared to a height of 150 ft. above the water. Then the machinist's mate who was carried as a passenger let the burden drop. There was a buoy attached so that the burden was recovered and was found, when wet, to weigh 175½ lb. So great was the stretch of the rope that the first part of the burden hung 100 ft. below the plane and the other part 150 ft. below, touching the water.

In November, 1920, Mr Cabot made arrangements with the Huff, Daland Co. to build a plane for the purpose of carrying on the experimental work to a point at which the Army and Navy would be interested in the idea. The plane which this company built for him was practically a duplicate of the type H D 1 4 training plane which they were at that time building for the Army, with the exception that in the Cabot plane two Le Rhone engines were placed in the wings and an opening was cut in the bottom of the plane, over which opening was mounted the apparatus for hoisting the burden This apparatus was driven from one of the engines as shown in Fig 4 The plane was completed and tested on the ice of the St Lawrence River in front of the Huff, Daland plant in February, 1921, and was shipped to Washington the following April

The Bolling Field Trials

A series of tests was then run off, the pilot flying over a loading rack set up near one end of Bolling Field A steel cable with a weight attached to the end was used to hoist the burden and it was found that if this weight was allowed to trail on the ground, the velocity at which it was necessary to fly the plane caused it to bounce high into the air in dangerous proximity to the pilot's elevators. In flying over the water the weight trailed well when it just touched the surface, but as soon as the plane flew a bit lower, it would rebound dangerously It was found, however, that with a little practice the pilot could gage his altitude very closely, and that the best height at which to fly was with the weight from 3 to 5 ft above the water or land

During the first set of experiments much trouble was experienced with the Le Rhone engines and the plane finally was damaged by a forced landing, because of engine trouble while flying over rough country

The plane was then rebuilt, two 10 cyl. 90 hp. Anzani engines were substituted for the Le Rhones and a second series of experiments started This plane was ready for flight by the middle of July 1921 These tests were also run at Bolling Field and the loading rack was placed on a scow in the Anacostia River, a tributary of the Potomac

The Equipment

The loading-rack used in both these series of experiments was similar in shape to that first used by Mr Cabot, but was now made of boards covered with 1-16 in iron plate It was 10 ft high and about 20 ft long and the opening at the large end measured 10 ft (Fig 1)

The snatch block used in the second series of experiments was quite different in design from Mr Cabot's original block, which had also been used in the first tests at Bolling Field, and which was made of oak re-enforced with rivets, but was not strong enough, and showed a tendency to split under strain The new block (Fig 3) evolved was a U-shaped aluminum casting, the ends of which slipped into pipes (Fig 2) which were attached to the sides of the rack at the narrow end, thus holding the U-shaped hook or nut as Mr Cabot called it in his early experiments, in a position which would allow the cable, as it hung from the moving airplane, to pass into the hook, guided by the converging sides of the rack

The burden, which rested on a shelf near the narrow opening of the rack, was attached by a steel cable to this hook or snatch-block, so that when the airplane passed over the the rack and the 60 ft cable with its weight fastened to the end slipped into the hook the burden would be snatched up practically instantaneously and hang suspended at the end of the cable to be reeled up into the airplane In order to keep the cable from sliping out of the U-shaped hook, having once entered it, a spring trigger was at first inserted in the opening of the U This device was found to be not wholly successful, however, for though in the second series of experiments a dummy burden was snatched from the loading rack three or four times, each time the block unlached itself by turning over in the air, thus allowing the cable to re-enter the slot, forming a loop which slipped out of the hook entirely and of course released the burden.

On one occasion during these experiments the cable hit the corner of the rack and the weight flew up over the top wing of the plane The cable caught first in one propeller and then in the other and started to wind up and pull the engines out of their mountings The plane therefore had to be landed on rather rough ground and the landing gear and lower wing were somewhat damaged

The plane was rebuilt with a single Anzani engine mounted in the nose of the fuselage, and with wires substituted for struts as wing bracing To prevent the weight from catching on the rack as had happened before, a smoothly rounded wooden strip was placed over the edges at the narrow end and the rack was re-built so as to give a slanting front It was also somewhat enlarged, so that it now had an opening of 14 ft and a length of 28 ft. This was done in order to make it easier for the pilot to guide his plane over it

It was evident that future experiments would have to develop a different type of block, one which would prevent the burden from slipping out after it had been once caught This was accomplished by using a bolt latch, held open by the supporting pipes, instead of the spring trigger first tried This new type was found in the third set of experiments to be wholly successful

Third Set of Experiments

With these improvements in plane and apparatus the third and last set of experiments to date was started on Sept 23, 1921, and these tests at last showed definite success The first picking up of a burden was accomplished on Sept 29 while Mr Cabot was witnessing the operations On that day two blocks of wood each weighing about 10 lbs were picked up and hoisted into the plane The next day a 5 gal can half filled with water was picked up together with a block of wood weighing about 15 lb

In connection with the picking up of gasoline it was necessary to devise a means by which the fuel could be transferred to the tanks of the plane For this purpose it was thought best to charge the gasoline tanks which were to be picked up with air pressure, so that when they were drawn up it was simply necessary for the operator to open a cock, and the gasoline would flow under the air pressure up into the tanks of the airplane

On Oct 1 the pilot succeeded in picking up a 10 gal tank in which 3 gal of gasoline had been placed, hoisting it into the plane and transferring the contents into the tank of the airplane The tank then picked up was made of 1-16 in steel and was enclosed in a heavy canvas sack The weight of the sack and tank together was 32 lb., so that with the 3 gal of gasoline the total weight was about 50 lb

The rope used consisted of 30 ft of ⅝ in rubber shock-absorber cord, which was attached directly to the weight, and spliced to what was 100 ft of ⅛ in steel cable, the other end of which was fastened to the winding-drum in the airplane This elastic rope prevented any shock whatever from being felt by the pilot In fact he had to look over the side to find out if he had picked up the burden

The pilots throughout the experiments were Captain Claude Devitals for the first set, Lieut H R Harris of McCook Field for the second, and Lieut E H Barksdale of Mitchell Field for the third

The operators, whose duty it was to give signals of altitude and direction to the pilot and to hoist in and handle the burden when received, were Philip H Gray for the first set, Sergt Crevier of McCook Field for the second, and Private Baker of Bolling Field for the third

So little difficulty was experienced in picking up the 50 lbs. in the last successful experiment that it was evident that a much greater weight could be picked up, but on account of the termination of Lieutenant Barksdale's leave the experiments had to be brought to a close It is planned however, possibly in the Spring, to make endurance flights, picking up gasoline at certain points, with the purpose of demonstrating the possibility of keeping a plane indefinitely in the air, since the latest experiments have proved beyond a doubt its practicability, it is more than likely that its possibilities will be recognized and further developments carried forward

The Loening Claim for the Collier Trophy

Principal Features of Document Submitted to Contest Committee, Aero Club of America, Claiming Outstanding Achievement During 1921

Below are reproduced portions of the claims for the Collier Trophy presented to the Contest Committee, Aero Club of America, by Albert P Loening on behalf of Grover C Loening for his having developed the Loening Model 23 monoplane flying yacht In addition to the details given below it is pointed out in the claim that the Loening Flying Yacht on Aug 16, 1921, made an altitude record, pilot and three passengers of 19,500 ft It also calls attention to the air transport performance made by this machine on Oct. 14 and 16, 1921, for the Wright Efficiency Trophy and to other flights made for civil purposes The claim having been allowed by the Contest Committee, the Collier Trophy was awarded to Mr Loening for the most outstanding achievement during the year 1921 —EDITOR.

The Loening Monoplane Flying Yacht presents the following original features, the work entirely of its designer, Grover C Loening

(1) The rigid truss monoplane wing structure, now recognized throughout the world as a successful and efficient form of construction

(2) The hull or flotation system which comprises a completely sealed unit or pontoon, independent of the cabin or cockpit There is no record of this form of construction in any other type of flying boat

(3) A cabin which is so arranged to comfortably seat five persons— the same arrangement as is found in a sedan automobile The walls of the cabin are high enough to keep out the wind and as the top is opened, the cabin possesses the advantages of an open cockpit, with none of the dangers but nearly all the advantages of a closed cabin in case of forced landing or accident

(4) The arrangement of a door to the cabin so as to form easy entrance and access where no climbing is necessary, particularly desirable when carrying lady passengers.

(5) The arrangement of a little deck leading to the bow of the boat, where an anchor is fastened, which makes it extremely simple to moor or anchor the boat.

(6) The twin-rudder tail construction, giving a large fin and rudder area, and carrying the stabilizer high above the center line of the propeller—a combination of features which has given this machine remarkable maneuverability and ease of control

(7) The detail construction of the hull, with a central and continuous girder, with a cross wire bracing system, giving a very light and strong body unit.

(8) The combination of the engine bed and center section wing structure into a solid unit composed of very few parts.

From a Passenger-Carrying Viewpoint

a) There is comparatively little vibration due to the efficient engine bed mounting

(b) The noise of the engine has been greatly reduced, due to the fact that the engine is aft and well over the single wing, with no upper wing acting as a sounding board to drive the noise of the engine downward.

(c) The vision in all the five seats is good, particularly in the two front seats.

From a Commercial Operating Viewpoint

(a) Speed—With a speed of 135 m p h , it is not considered necessary to take up the time of the Committee in the demonstration of the advantage of great speed We all realize that speed is the *raison d'être* of the airplane. It is interesting, however, to point out that the high speed being 135 m p h. and the low speed 55 m.p h , leaves a range of 80 miles which is as great as the high speed of most of the flying boats in use today

(b) Climb—As has already been stated, this machine has a very rapid climb—10,000 ft. in 11 min. This is unequalled by any flying boat carrying five passengers of which there is any knowledge at the present time

This rapid climb permits the machine easily to get out of small bodies of water, which means that it can land and take off from small lakes which have hitherto been inaccessible to flying boats.

(c) Fuel Consumption—The fuel consumption is low, it having been demonstrated that the machine flying at 120 m p h and carrying five passengers, consumes only one gallon of gasoline every five miles flown It consumes 1 1/3 gal of oil for every 100 miles flown

(d) Ease of Maintenance—Although ease of maintenance is essentially a detail that any good airplane should have, it is a fact that the art up to date has been conspicuously lacking in well designed planes from this standpoint The superiority of this new plane on maintenance and accessibility is, however, so great as to warrant having attention called thereto There is hardly a pipe or connection of any kind that cannot readily be examined or replaced without the removal of any other part of the plane,—the entire gas tank system and its connection being completely accessible by merely unhinging and lifting up the rear seat

In addition to that, all the controls and the vital parts of the plane have been kept out in the open, without any serious detriment to performance and yet enabling these parts to be examined offhand at any time, and always accessible for oiling and cleaning

(e) Replacement—The engine may be removed from the machine without disturbing the radiator or any other part The gas tank, oil tank, radiator, propeller and other such vital parts are also equally accessible and readily removed

One of the most important features of the design—the water-tight sealed hull—is in itself also designed for ready replacement, as it is possible to shift hulls on this craft without in any way interfering with the engine bed and wing structure or the cabin around the seats.

These features are essentially all practical features of commercial value in maintenance, but nevertheless, their combination constitutes a very desirable contribution to the art, to the importance of which much too little attention has been paid.

The ease of maintenance and alignment of the monoplane wing structure is well-known and has already been completely demonstrated in other Loening monoplanes

Pressure Distribution over the Horizontal Tail Surfaces of an Airplane, II

N.A.C.A. Report No. 119

F. H. Norton and D. L. Bacon

This investigation was undertaken in order to determine whether the results obtained upon model tail surfaces can be used to accurately predict loads upon the full-sized tails and also to find the distribution of load when large elevator angles are used, as the loads from such angles can not be obtained readily in free flight. The method consisted in using a metal horizontal tail surface inside of which small air passages, connecting with a series of holes in the surface, led the pressure off from the tail in rubber tubes. In this way the pressure at each of these holes was measured by a manometer at several angles of attack and several elevator settings. The results show that the model tests give a loading which is equivalent to the loading under similar conditions in the full-sized airplane and that the manner of distribution is quite similar in the two cases when there is no slipstream.

A copy of Report No. 119 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C

"Who's Who in American Aeronautics"

(Copyright, 1921, by The Gardner, Moffat Co., Inc.)

The biographical sketches of men who are prominent in American Aeronautics are printed periodically in AVIATION. The first series will be shortly published in a more durable form, and revised issues will be published semi-annually to take care of the frequent changes in station of Army and Navy officers, and such other changes as may occur. As errors and omissions are liable to occur in a compilation of this character, interested parties are requested to notify "Who's Who" Editor of the necessary corrections so the record may be kept up to date.

Harold Linder Pope

POPE, HAROLD LINDER, Engineer; born Newton, Mass., Nov. 6, 1879; son of Colonel Albert Augustus Pope and Abby (Linder) Pope; married, Clara Belle Hinckley, March 19, 1901.

Educated: 1898 Peekskill Military Academy; 1902, Mass. Inst. of Tech.

Professional: 1903-1906 Assistant Superintendent, Pope Mfg. Co., Hartford, Conn.; 1905-1907, Factory Manager, Pope Mfg. Co., Hagerstown, Md.; 1907-1909, Factory Manager, Pope Motor Car Co., Toledo, Ohio; 1909-1910, Factory Manager, Matheson Motor Car Co., Wilkes-Barre, Pa.; 1910-1914, Factory Manager, Pope Mfg. Co., Hartford, Conn.; 1914-1916, Factory Manager, Parro Machine and Foundry Co., Cleveland, Ohio; 1916-1918, Factory Manager, Wright-Martin Aircraft Corp., Los Angeles, Calif.; 1918 to date, Factory Manager, Wright Aeronautical Corp., Paterson, N. J.

Member: Engineers Club (N. Y.), Hamilton Club (N. J.), Montclair Athletic Club, Society of Automotive Engineers, American Society of Mechanical Engineers.

Present Occupation: Factory Manager, Wright Aeronautical Corp.

Address: 238 Lewis St., Paterson, N. J.; home, 163 Edgemont Road, Montclair, N. J.

Selden Thornton Williams

WILLIAMS, SELDEN THORNTON, Aeronautical Engineer; born Canton, N. Y., Feb. 7, 1892; son of Frank F. Williams, M.D., and Lillabel A. (Thornton) Williams; married Ella E. Vogire, Oct. 12, 1918.

Professional: Canton public schools; B.S. 1913, St. Lawrence University; B.S. in Mechanical Engineering 1916, Worcester Polytechnic Institute.

Professional: Technical Editor, Motor World Magazine, 1916-1917; Aeronautical Engineer, Naval Aircraft Factory, 1918 to date.

Aeronautical Activities: Experimental Engineer, Naval Aircraft Factory, observer on trial flights 1918-1919; Project Engineer 1919 to date.

War Service: Civilian Aeronautical Engineer, Naval Aircraft Factory.

Books: "Automobile Repairman's Helper."

Member: Society of Automotive Engineers.

Present Occupation: Aeronautical Engineer.

Address: Navy Yard, Philadelphia, Pa.; home, 907 Merrimac Road, Fairview, N. J.

James Frederick Prince

PRINCE, JAMES FREDERICK, Commercial Aviation; born Roselle, N. J., Nov. 20, 1887; son of George S. Prince and Ida F. Prince; married Vera G. Tiffany, Oct. 16, 1915.

Educated: Public schools of Yonkers, N. Y.; A.B. 1910, Columbia University.

Professional: Assistant Secretary, International Motor Co., 1912-1916; Assistant Treasurer and Treasurer, Curtiss Aeroplane & Motor Corp., Buffalo, 1916-1918; Secretary, Wright-Martin Aircraft Corp., 1918-1919; Secretary-Treasurer, Wright Aeronautical Corp., 1919 to date.

Present Occupation: Secretary and Treasurer, Wright Aeronautical Corp.

Address: 286 Lewis St., Paterson, N. J.; home, 9 Gibson Place, Elizabeth, N. J.

Frederick Brant Rentschler

RENTSCHLER, FREDERICK BRANT, Commercial Aviation; born Hamilton, Ohio, Nov. 9, 1887; son of G. A. Rentschler and Phoebe S. Rentschler; married, Faye Belden, July 25, 1921.

Educated: 1909, Princeton University.

Professional: 1910-1917, Hooven Owens Rentschler Co. and Hamilton Foundry and Machine Co., Hamilton, Ohio; 1917-1919, Captain A.S., A. P., Production of Aeronautical Engines and Planes; District Manager, Aircraft Production, New York District.

Member: Aero Club of America, Aeronautical Chamber of Commerce.

Present Occupation: President, Wright Aeronautical Corp.

Address: 286 Lewis St., Paterson, N. J.; home, 174 Midland Ave., Montclair, N. J.

Ralph Stanton Barnaby

BARNABY, RALPH STANTON, Engineer; born Meadville, Pa., Jan. 21, 1893; son of Charles Weaver Barnaby and Jennie (Christy) Barnaby.

Educated: 1900-1908, Grace Church Choristers School, New York City; Trinity School; Mechanical Engineering 1916, Columbia University.

Professional: Elco Co., Bayonne, N. J., 1915-1916; Production Engineering, in charge of subchaser assembly and test base at Montreal, P. Q.; The Standard Aero Corp., Jan. 1917 to Dec. 1917, Assistant Chief Engineer and head of Engineering Department.

Aeronautical Activities: 1907-1909, Model Air plane experiments; 1909-1911, man carrying gliders, first power flight 1911, aeronautic representative for Elco Co., design and construction work for Standard Aero Corp.; aviation duty in Navy 1917 to date.

War Service: U. S. Navy 1917 to date; overseas during war.

Member: Society of Automotive Engineers, A.S.M.E., A.C.A., Army and Navy Club, Columbia University Club.

Present Occupation: Lieutenant, Construction Corps, U. S. Navy, Engineer at Naval Aircraft Factory.

Address: Naval Aircraft Factory, Navy Yard, Philadelphia, Pa.

John Thompson Patterson

PATTERSON, JOHN THOMPSON, Commercial Aviation; born Castle Wellan, Ireland, Aug. 20, 1887; son of John Patterson and Sarah (Adair) Patterson.

Educated: Public schools of Detroit, Mich., University of Michigan, Leland Stanford University.

Professional: 1908-1910, Assistant Secretary, Chamber of Commerce, Sacramento, Calif.; 1911-1912, Secretary and Business Manager, Maxi motor Co.; 1912-1918, General Manager, Patterson Aviators and Patterson Aeroplane Co.; 1918, Director, General Manager, Universal Aviation Co.; 1920-1921, General Manager, Solar Aerial Co.

Aeronautical Activities: Handled motor sales through U. S. also abroad; presented hundreds of exhibitions throughout U. S. and Canada; operated school; promoted corporations and projects; designed, constructed and flew aeroplanes; designed and operated the first folding wing biplane and seaplane; commercial aero photography; intercity passenger service.

War Service: Naval Reserves, detached for design and organization of facilities passed to Naval Air Service.

Member: Michigan Commercial Aero Association.

Present Occupation: Flying and Manager, Solar Aerial Co.

Address: 5216 Trumbull Ave., Detroit, Mich.

William Colb Morris

MORRIS, WILLIAM COLB, 1st Lieut., Air Service; born Harrisburg, N. C., Aug. 4, 1891; son of Zeb A. Morris and Sallie (Culp) Morris.

Educated: Concord High School, Wright Bros. Preparatory School, Davidson College, U. S. Military Academy.

Professional: Salesman for Nash Bros. of Minneapolis with stations at Winnipeg, Manitoba, Canada and Yorkton, Saskatchewan, Canada.

Aeronautical Activities: U. S. School Military Aeronautics, Berkeley, Calif., 1917; flying training at Rockwell Field; Gerstner Field; Advanced Pursuit Training at Issoudun, France; 1st Aviation Ins. Center for Advanced Gunnery Course; discharged July 1919; re-entered service Sept. 1920; flying instructor at March Field; test pilot and assistant engineering officer, 88th Squadron; attached to 14th A.S. in connection with bombing off Virginia coast.

Flying Rating: Reserve Military Aviator, March 1918; Airplane Pilot, Oct. 1920.

Present Occupation: 1st Lieut., Air Service.

Address: Ellington Field, Tex.; home, 67 S. Main St., Concord, N. C.

Robert P. Hewitt

HEWITT, ROBERT P., Test Pilot; born, Philadelphia, Pa., July 2, 1894; son of Luther E. Hewitt and Nellie (Jennings) Hewitt; married, Millicent G. Hand, Dec. 7, 1917.

Educated: Central High School, Philadelphia, Pa.; Temple University.

Professional: Civilian Aviation.

Aeronautical Activities: 1911, Building and flying gliders; 1916, instructing and test pilot, Call Field; detached service, Naval Air Station, Miami; 1919, Chief Pilot, Aero Limited; 1920, Aero Ltd. and Aero Service Corp., Philadelphia, Pa.; 1921, Wright Aeronautical Corp.

Flying Rating: Aero Club Pilots Certificate No. 6909; Experts Certificate No. 266; Civilian No. 701; Reserve Military Aviator.

War Service: 2nd Pennsylvania F. A. from beginning of war to Sept. 1917 when transferred to Air Service.

Member: Aero Club of America, Automobile Association.

Present Occupation: Test Pilot, Wright Aeronautical Corp.

Address: 266 Lewis St., Paterson, N. J.; home, 111 E. Durham St., Philadelphia, Pa.

Louie Maurice Robb

ROBB, LOUIS MAURICE, Commercial Aviation; born, Merchantville, N. J., Feb. 12, 1896; son of Daniel Robb and Marie F. Robb.

Educated: Abington Friends School, Jenkintown, Pa.; Mechanical Eng. 1916, Drexel Institute College of Engineering.

Professional: Western Union Tel. Co., 1916-1917.

Aeronautical Activities: Army Air Service, 1917-1919; pilot and instructor for Philadelphia Aero Service Corp., 1919-1921; passenger carrying with F. T. Holt under name of Universal Air Service 1921 to date; cooperated in the design and construction of the Kelly Field Kootie motorcycle engine biplane, 1919.

Flying Rating: Reserve Military Aviator, Aug. 1918.

War Service: Army Air Service, Aug. 1917 to June 1919.

Present Occupation: Passenger carrying.

Address: Universal Air Service, Parkersburg, Pa.; home, 416 N. 60th St., Philadelphia, Pa.

Flavins Afton Donaldson

DONALDSON, FLAVINS AFTON, Civilian Aviator; born, Milford, Iowa, Jan. 6, 1897; son of R. E. Donaldson and Flora B. Donaldson.

Educated: Milford High School, University of Iowa.

Aeronautical Activities: Enlisted at Kelly Field, Dec. 1917; S.M.A., Austin, Tex., March to June; Camp Dick, June 1918; Carruthers Field, July to Nov. 1918; Brooks Field, Nov. 1918 to Jan. 1919; civilian flying from Jan. 1919 to date; won the 20 mile race at Omaha, Nov. 6, 1921, for planes with a speed of 75 m.p.h. or under. Also won the Junior Larsen Trophy on Nov. 6, 1921.

Flying Rating: Reserve Military Aviator, Oct. 1918.

War Service: Dec. 1917 to Jan. 1919.

Present Occupation: Civilian aviator.

Address: Milford, Iowa.

William Redmond Cross

CROSS, WILLIAM REDMOND, Banker; born South Orange, N. J., June 6, 1874; son of Richard James Cross and Matilda Cross; married, Julia Newbold, April 16, 1919.

Educated: Groton School; A.B. 1896, Yale University.

Professional: Banker.

Aeronautical Activities: Management Committee, Belmont Park Aeronautical Meet, 1910; Governor, Aero Club of America, 1911-1921.

Flying Rating: Aero Club of America License No. 65.

Present Occupation: Banker.

Address: 61 Pine St.; home, 12 East 80th St., New York City.

A New Torpedo Seaplane for the U. S. Navy

Curtiss Cantilever Monoplane Driven by Twin Engines Represents Notable Advance in Aeronautical Engineering

Front view of the new Curtiss torpedo seaplane (two 385 hp. Curtiss CD12 engines). The great depth of the wings in the center section, and the clean all-around design are noteworthy.

The big internally braced monoplane, above illustrated, now being tested at the Naval Air Station, Anacostia, is a development by the engineers of the Curtiss company working under the supervision of the Naval Bureau of Aeronautics. The problem was to develop a plane large enough to carry a full-size torpedo and able to maneuver quickly and accurately around a hostile fleet and find, without detection, the proper position for launching the torpedo.

Unlike the big bombing planes, which drop their bombs from a great height where they are more or less free from anti aircraft fire, the torpedo plane must deliver its projectile from within a few feet of the surface of the water. Therefore, it is essential that the machine be practically invisible. The Curtiss torpedo seaplane more nearly meets these requirements than most other aircraft, as at a distance of two miles it is practically invisible, due to its monoplane construction.

This seaplane is equipped with two 385 hp. Curtiss CD12 engines installed in small nacelles which project forward but slightly beyond the front edge of the wing. The pilot, gunner and bomber are located in a cockpit in the middle of the big wing.

The twin floats which support the plane on the water have considerable excess flotation to allow for safe operation in rough seas.

THE CONTEST COMMITTEE
of the
AERO CLUB OF AMERICA

Requests all owners (individuals or companies) of aircraft in the United States to register in order that the Committee may

1. Send, gratis, the Aero Club's Contest Rules for 1922, and notices of proposed aviation meets.
2. Assist local Clubs in organizing contests best adapted to the types of airplanes in their locality.
3. Have a record of airplanes and pilots available throughout the country in times of emergency.

USE THIS FORM

CONTEST COMMITTEE, AERO CLUB OF AMERICA;
11 East 38th Street, New York City

Date ....

I } have .... (Airplanes) (Seaplanes) (Flying Boats) (Airships) (Free Balloons)
We } (Give number)

Make and Model ....

Motor, Make and Model ....

Maximum speed of ....m.p.h.

Capable of continuous flights of .... miles

Cubic capacity of gas bag .... cu. ft.

Underwriters' Laboratories Aircraft Registration No ....

Pilot's name ....

Address ....

Owner's name ....

Address ....

Aeromarine Services

The daily passenger service which Aeromarine Airways have resumed on the Key West, Fla. to Havana route is being well patronized by visitors of the Florida beaches and of the Cuban capitol. Charter flights from the various resorts are also proving very popular

Last week a party of well-known Wall Street financiers, composed of Charles E. Mitchell, President of the National City Bank, Percy G Rockefeller and E P Swenson, Chairman of the Board of Directors, chartered the Aeromarine-Navy eleven-passenger flying boat Ponce de Leon, and made the flight from Key West to Havana in 70 min, which is the best time so far made on this route In the group also were Guy Carr, Joseph P Grace and Lee Olwell, associates of the Board Other interests were represented by Gordon S. Rentschler and E. A Deeds of Ohio

Owing to the large amount of baggage of this party, officials of the Aeromarine Airways sent another eleven-passenger flying boat to Havana as a special baggage carrier, so that the entire party and their baggage arrived in Havana before the steamer had left its dock at Key West and thereby saved one day's valuable time.

On Jan. 13 the Aeromarine flying boat New York, Pilot Culbertson, en route from Miami, Fla., to Bimini, Bahamas, with three passengers, made a forced landing at sea owing to a damaged propeller The damage is believed to have been caused by a small part of the engine which got loose and flew into the propeller, injuring a tip The pilot then taxied the boat to the nearest land, which proved to be St. Isaacs Reef, 18 miles N of Bimini, where the lighthouse keeper cared for the voyagers.

As no radio communication exists between St Isaacs and the main land, the marooned party was only rescued on the third day, when the lighthouse keeper put off in a small boat for Bimini, whence a yacht was dispatched to St. Isaacs.

As a result of this lack of communications some anxiety was voiced by the daily press for the New York until the news of its safety reached the outside world, although the operators of the flying boat felt entirely confident as to its ability to outride when afloat anything short of a hurricane Their faith in the seaworthiness of the HS2L type—to which the New York belongs—is well justified in view of the excellent record these flying boats made during the war in the service of Naval Aviation It would nevertheless seem advisable to fit passenger flying boats operating off shore with radio apparatus, as the International Air Convention stipulates for it would facilitate the locating of a disabled machine, while on the other hand it would allay needless fears of the air travelers' relatives

Parkwater Airdrome

Renewal of the lease of the Parkwater aviation field has been asked of the Spokane, Wash, park board by the United States Aircraft Corp This firm has had control of the field two years, during which it constructed a hangar at a cost of $3500 and installed an oil and gas station where visiting flyers could get service In the past 2 per cent of the gross receipts of the field has gone to the city

The company now proposes that charges for service at the field and receipts from the field, with the exception of money actually taken in by the company itself, be turned over to the city Under this plan the field would be open to all flyers with the stipulation that local commercial flyers should pay the city a proportion of their earnings

Seaplanes and Opium Smuggling

A report from the naval air station, Pearl Harbor, Hawaii, states that on Dec 5 a flight was made to assist the local custom authorities in the supression of a suspected attempt at opium smuggling In this case the S S Hoosier State was convoyed by an H boat from Honolulu well out to sea off the island of Molokai, the movements of all sampans and other small boats off the coast of Oahu being closely watched at the same time Any attempt at such smuggling operations to have been carried out was prevented

Lighter-than-Air Personals

William C Young, well known in aero circles, has just been made manager of aeronautical sales of The Goodyear Tire & Rubber Co succeeding Willard P Seiberling Mr Seiberling, who was aide on the balloon "City of Akron" in the 1921 Gordon Bennett balloon race, has joined the new Seiberling Rubber Co established by his father, F. A. Seiberling, former Goodyear president

William C. Young

Mr Young is a native of Ohio, a graduate of Hiram college and won an engineering degree from the University of Virginia in 1915. During the war he qualified as a balloon and airship pilot, was stationed for a time at Wingfoot Lake Air Station, Akron, and later was sent to Europe by the U. S. Signal Corps to study aeronautical developments in the war zone He is a member of the Aero Club of America and the Akron University Club He has been assistant manager of aeronautical sales at Goodyear since the war

Naval Aviation Officers to Germany

The first detachment of Naval Aviation officers ordered to Germany to supervise and inspect the construction of the L71 type rigid airship authorized by the Allied Council has left the United States.

Lt. Comdr Zachary Lansdowne, U S N., who has been in charge of the Lighter-than-Air branch of the Bureau of Naval Aeronautics was detached from that service on Jan 16 and detailed as Assistant Naval Attache at Berlin, Germany, where his duties will also include the supervision of the German commercial airship soon to be undertaken at Friedrichshafen, Germany Commander Lansdowne, an expert on lighter-than-air craft made, the trans-Atlantic trip on the British airship R-34 in July 1919, being the only American on the trip over

Lt. Comdr G Fulton, of the construction department of Naval Aviation, has been ordered to proceed to Germany to organize a bureau of aeronautical inspection

It is understood that Lieut R G Pennoyer, a survivor of the American ZR-2 detachment Howden, may also be detailed to inspection duty in connection with the building of the Navy's great rigid airship

Equipment of Record-Breaking JL6

Numerous requests have been received for information as to the ignition system of the B M W 6 cyl 185 hp engine with which the JL6 all-metal monoplane established on Dec 29 and 30, 1921 a world's endurance record of 26 hr 19 min 35 sec. This applies as well to other items of *materiel* used in the flight

The following are items upon which information has been received

Magnetos	2 Robert Bosch Type ZU6
Spark Plugs	Mosler
Fuel	Commercial Gasoline
Lubricant	Mobile Oil A.
Propeller	Hartzell Walnut.
Oil Strainer	Colador Engineering Corp
Varnish	Valspar

Public Works for Naval Aviation

During the fiscal year 1921, thirty-two contracts for new construction at naval air stations were awarded, totalling more than $3,250,000 This work included the completion of the Lighter-than-Air Station at Lakehurst, N. J, the construction of a complete new Heavier-than-Air Station on Ford Island, near the Naval Station, Pearl Harbor, Hawaii, and the construction of miscellaneous shops, distributing systems, and facilities at various other naval air stations.

Construction work on the power house, hangar, and officers' quarters at the airship station, Lakehurst, was practically completed during the fiscal year, and the distributing systems, hydrogen plant, mooring mast, dispensary, and various other items were constructed there, completing the station for occupancy by thirty officers and five hundred men, and for the construction and housing of the airship ZR1

The work at Pearl Harbor consisted of a seaplane hangar and runway, shops, storehouses, barracks, mess hall, dispensary, officers' quarters, distributing systems, pier, and other facilities for a complement of 50 officers and 400 men At San Diego a reinforced concrete pier, a large shop, and several smaller buildings were constructed, greatly enlarging the facilities of that station. Shops, distributing systems of various kinds, and miscellaneous features were also constructed at several other air stations

—*From the Annual Report of the Chief of the Bureau of Yards and Docks Navy Department*

Work on GB Seaplane Suspended

It has been rumored for several months that work had stopped on the G B. (giant boat) naval seaplane under construction at the Philadelphia Naval Aircraft Factory Confirmation has recently been received that construction of the G B. seaplane has been indefinitely suspended due to lack of appropriations with which to carry on the work.

When the work was suspended the hull, interplane struts, wing beams and a large number of ribs had been completed, as well as the three multiple drive power units in each of which is housed three Liberty 12's geared to one propeller shaft The power units were developed and constructed by the Gallaudet Aircraft Corp. of East Greenwich, R I These power units are now being boxed and stored at the Gallaudet plant

Losing a Wheel in the Air

L. C Weinberg was the principal party in a nerve-trying circumstance the other day at McCook Field, when the Curtiss plane he was piloting dropped one of its landing gear wheels just as the plane was taking off

When the pilot saw that he had lost a wheel he arose to some 2000 ft and unhooking his belt, hung out of the cockpit in an endeavor to see which wheel had broken loose These attempts proved futile, as on each occasion the plane went immediately into a dive Finally devising upon another plan Weinberg came down a bit and while holding the stick with his knees began signalling with his arms to the men on the ground The onlookers immediately caught the idea and held up the left arm to signify the wheel lost

Upon alighting the flier banked his left wing and held the ship over on the angle The plane veered along on the right wheel for a distance and then went over on her nose with but slight damage, and no injury to the pilot

—*Slipstream*

Air Survey of Jasper National Park

Maj G M. Croyl, Superintendent of Canadian Government Air Service in Southern Alberta, has surveyed Jasper National Park from the air During his flights he used a DH-4 machine with full photographic equipment. It was necessary to use a very small field as a base and this field was the only landing place within the area surveyed This preliminary survey will enable the authorities to lay out trails and camps for campers. This park is reached by the Canadian National Railways and contains four thousand square miles. During this survey Major Croyl discovered a new lake situated at 7000 ft. altitude

Aviation in Congress

Dec. 6, 1921, to Jan. 4, 1922.

Dec 6 House Mr F C Lanham speaks in the House relative to the flight of the C-7 inflated with helium. Accomplishment marks a new era in aviation

Dec. 10 House Mr Steenerson a bill (H R 9462) to encourage commercial aviation and authorizing the Postmaster General to contract for air mail service, and prescribing rates of postage thereon; to the Committee on Post Office and Post Roads.

Dec 12 Senate Mr. Borah (S Res 188) Directing the Secretary of War to send the Senate the report of General Mitchell relative to the sinking of battleships at Langley Field, filed in September 1921 Agreed to—See under Jan. 4, 1922.

Dec 19 House Mr Parrish a bill (H R. 9635) to provide for flying pay for officers and enlisted men of the regular army who are incapacitated by reason of injuries incurred in or by aircraft accidents, to the committee on military affairs.

Dec 20 House Mr. Hicks a bill (H R 9667) to authorize the Secretary of Commerce to establish a bureau of civil aviation in the Dept. of Commerce, to encourage and regulate the operation of civil aircraft in interstate and foreign commerce and for other purposes; to the committee on Interstate and Foreign Commerce.

Dec 21 Senate Mr Walsh (S. Res 200) directing the committee on naval affairs of the Senate to investigate the transfer and examination held in connection therewith of officers of the naval air service and members of the naval reserve flying corps Ordered to lie over on rule.

Dec 23 Senate S Res. 200 agreed to

Jan. 3 House Executive communication 443 A letter from the Acting Secretary of the Navy transmitting a tentative draft of a bill for the purchase of the naval aviation station at Galveston, Tex and appropriating $18,000 for same, to the Committee on naval affairs

Jan 4 Senate Letter from Secretary of War in answer to a communication dated Dec 13 re S. Res. 188 (see under Dec. 12) and stating that he was directed by the President to say that he considered the transmission of the report in question incompatible with the public interest, to the committee on naval affairs

—*Aeronautical Chamber of Commerce*

Air Base at Ft. Ethan Allen

The authorities at Fort Ethan Allen are in communication with the Army Air Service headquarters at Washington in an endeavor to have an airplane base established permanently at the post This is in addition to the corps of aerial photographers who are to map the State of Vermont from the air for military purposes.

Coming Aeronautical Events

AMERICAN

Apr 30 — *Spring Show and Opening Meet, Curtiss Field, Mineola, L I*

May — *National Balloon Race*

Sept 4 (about) — *Detroit Aerial Water Derby, Detroit. (Curtiss Marine Flying Trophy Competition.)*

Sept 15 (about) — *Detroit Aerial Derby, Detroit. (Pulitzer Trophy Race.)*

Sept. 30 — *First Annual Interservice Championship Meet (In preparation)*

FOREIGN

Aug 1 (about) — *Coupe Jacques Schneider. (Seaplane speed race) Italy probably Venice*

Aug. 6 — *Gordon Bennett Balloon Race, Geneva, Switzerland*

Oct 1 — *Coupe Henri Deutsch de la Meurthe. (Airplane speed race.) France*
American elimination trials, if required, to be held about Aug. 15, at Mitchel Field, L I

Foreign News

Dutch East Indies

By consent of the Dutch government, two aviation schools have been opened under the supervision of German flying officers, in the Dutch East Indies.

France

Admiral Fournier has communicated to the Academie des Sciences an account of successful tests of apparatus for the guidance of planes to their aerodromes by night or in fog carried out at Villacoublay by Lieutenant Loth of the French Navy.

After more than a year's work Lieutenant Loth, who worked out a system of guiding ships into port in the thickest fog by wireless a couple of years ago, has devised a similar apparatus for planes which adds less than 10 lb. to the weight of the machine. On ground there is a guiding cable with an alternating current of 600 vibrations per second. In the machine there are three receiving devices. One of them records a deep and loud musical sound—which the pilot hears with the aid of ear-pieces fixed in his helmet—so long as the machine is flying parallel with the cable. The sound diminishes when the direction of the machine makes an angle with the cable and ceases altogether when the direction is at right angles to the cable. The second spiral records its loudest sound when the machine is flying at right angles to the cable and ceases to record when the plane is going parallel. The sound recorded by the third spiral varies according to the distance of the machine from the cable, but it stops dead the moment the machine crosses the cable. The sounds can be caught as high up as 10,000 ft. and for a mile and a half on either side of the cable.

The first experiments failed because the sounds were drowned by the noise of the motors, but ear-pieces fixed in the helmets have overcome this difficulty.

Italy

The Minister of War has approved the proposal of the High Command for Aeronautics to hold two flying contests during September 1922, the Tyrrhenian Cup and the Italian Grand Prix. There will also be a parachute competition with prizes of 500,000 lire and a balloon contest with prizes of 30,000 lire. All the above events are international.

In order to encourage those aircraft constructors whose machines do well in the contests, the Ministry of War has set aside 400,000 lire for the acquisition of these machines which will then be handed to the civil aviation companies by way of subsidy in kind, for the operation of civil air services.

Japan

An Aviation Technical Institute and Aviation Council have been appointed under the Minister of Education. The institute will be attached to the Tokyo Imperial University. The Minister of Education will be the president of the Council which will have twenty professors. Its duty will be "to deliberate upon important matters concerning the basic theoretic principles of flying machines".

Great Britain

The success which attended the first British air conference, held in London last year, has led to the decision to hold a second conference at the Guildhall in February next, under the auspices of the Air Ministry. At the last conference service questions occupied a good deal of attention, but it has been decided that the February gathering will be concerned mainly with the development of commercial aerial transport. All aspects of this question will be discussed. Lord Weir has agreed to preside over the technical sessions.

Invitations to the Conference are being issued to all those interested in the development of air transport, and arrangements are being made for demonstrations by aircraft and for a visit to the Croydon aerodrome for an inspection of as many types of machines as can be gotten together for exhibition purposes.